

ABSTRACT

VORTEX COOLING FOR TURBINE BLADES

5 A near wall cooling technique for cooling the pressure and suction sides of a turbine airfoil that includes a matrix of cells oriented chord-wise and extending longitudinally having vortex chambers with vortex creating passages feeding coolant from interior of the blade to each of the cells, interconnecting passageways interconnecting each of the vortex chambers and a discharge film cooling passageway discharging coolant adjacent the outer surface of the pressure and suction sides. The alternate passageways are staggered and each are tangentially oriented to introduce a swirling motion in the coolant as it enters each of the vortex chambers. The cells may be oriented to be in a staggered or in an in-line array and the number of cells, the number of vortex chambers and the dimension of the cells, vortex chambers and passageways are selected to match the heat load and the temperature requirements of the material of the blade. The direction of flow within each cell is selected by the designer. The aft portion may be internally cooled before discharging the coolant as a film upstream of the gage point to avoid aerodynamic losses associated with film mixing.

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